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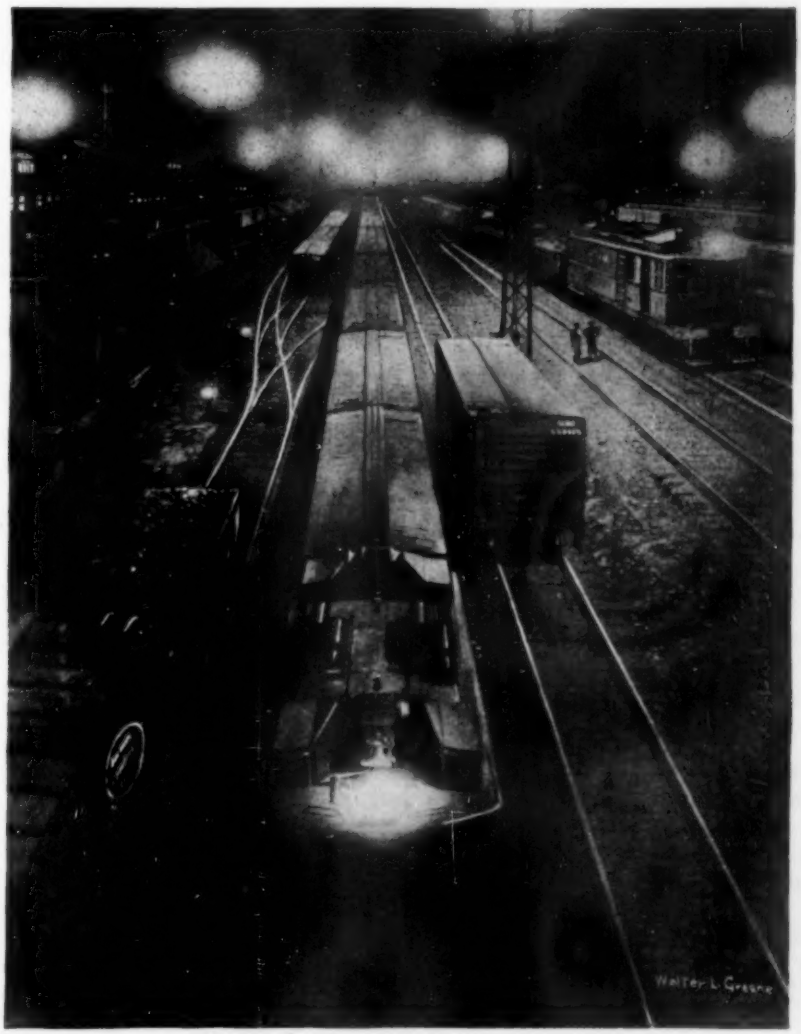
SCIENCE NEWS-LETTER

The Weekly Summary of Current Science

A SCIENCE SERVICE PUBLICATION

$5 a year 15c a copy May 11, 1929



ELECTRICITY AND RAILROADS

Light and Power Flow Silently on Wires

(See page 286)

Vol. XV No. 422

Insect Hunting on Ocean

Entomology

Steamship travellers with time hanging heavy upon their hands at various ports of call can aid entomology by becoming insect collectors, Dr. T. D. A. Cockerell, of the University of Colorado, has just suggested in a communication to the English scientific journal, *Nature*.

Professor Cockerell recently made a trip around the world. He noticed that the bright lights of ships at anchor enticed insects from the shore and made them fly out to the ship. Taking advantage of these insect visits, he was able to make collections from ports and countries at which he was unable to visit.

Ships probably play an important part in the spread of insects throughout the world, Professor Cockerell suggested. He urged travellers to collect insects that they observe coming aboard ships. For beetles, for instance, the voyager need only preserve them in a small bottle of alcohol.

"A more ambitious but interesting project," said Professor Cockerell, "would be to take out a small vessel with a bright light and determine just how far from the shore insects of different kinds can be attracted."

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Electricity and Railroads

Engineering

The thoroughgoing analysis of transportation problems, which has occupied so much attention for the past few years, established the fact that conditions in terminals and yards are the greatest stumbling block to the rapid and inexpensive movement of freight, which is so necessary to the economic operation of the railroads. As a result, much time, money and ingenuity have been expended by the railroads to improve these conditions wherever possible, so as to increase the facilities for clearing freight.

One improvement that naturally suggested itself was that of lighting the yards by some method that would permit work to be carried on at night with the same speed and safety as during daylight hours. The modern floodlighting projector has made this possible, as shown on our cover.

The picture is from a painting made by Walter L. Greene for the General Electric Co., through whose courtesy it is reproduced.

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Are Farmers Dying Out?

Genetics

While Congress is trying to form a law to help the farmers, a biological law is working in such a way that there soon will be no more farmers to be helped. At that time or shortly after, our civilization will collapse. This will come as the result of the urbanization of the best of the human farm stock, prophesies O. F. Cook, of the U. S. Department of Agriculture, in the *Journal of Genetics*.

The brightest farm boys and girls, the most capable farm families, are being drawn to the cities, with apparent advantage both to themselves and the cities. However, in the cities small families are the rule, living is hard and competition is fierce. Farm families that move there die out quickly. Meanwhile the supply on the farms is constantly growing smaller and less promising.

"In the continued drafting of the more capable elements from the farm to the cities," Mr. Cook sees "a process of adverse selection which has the power to destroy our civilization like others of the past."

Any steps toward farm relief that do not take into account the biological factors involved stand little chance of succeeding. It is these factors that must largely determine the future of the nation and the race, Mr. Cook declared.

"Liberty enlightened the world from America because life was lived most constructively in American farm homes," Mr. Cook said. "The Colonial and pioneer periods developed essential human values which are in danger of being lost through urbanism. Without the constructive life and discipline of the farm homes, our democratic institutions are at stake."

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SCIENCE NEWS-LETTER, The Weekly Summary of Current Science. Published by Science Service, Inc., the Institution for the Popularization of Science organized under the auspices of the National Academy of Sciences, the National Research Council and the American Association for the Advancement of Science.

Edited by Watson Davis.

Publication Office, 1918 Harford Ave., Baltimore, Md. Editorial and Executive Office, 21st and B Sts., N. W., Washington, D. C. Address all communications to Washington, D. C. Cable address: Scienserve, Washington.

Entered as second class matter October 1, 1926, at the postoffice at Baltimore, Md., under the act of March 3, 1879. Established in mimeographed form March 13, 1922. Title registered as trade-mark, U. S. Patent Office.

Subscription rate—$5.00 a year postpaid. 15 cents a copy. Ten or more copies to same address, 5 cents a copy. Special reduced subscription rates are available to members of the American Association for the Advancement of Science.

Advertising rates furnished on application.

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INTERPRETING week by week the latest developments in the various fields of science, this magazine attempts also to present its articles in the most pleasing and readable typography and the most convenient arrangement.

The *clippability*, *indexing*, and *automatic dating* of each article are unique features.

This is a *separable magazine*. Each original article can be clipped or torn out without losing or damaging another important article on the other side. These original articles are backed by reprinted quotations or excerpts, short one-sentence items, advertisements, and other material not likely to be clipped and preserved.

Each article is automatically *indexed* by the key word printed in italics just below the heading, or at the end of the article when the article has no heading. Articles can thus be filed easily into any system of classification, whether it be Library of Congress, Dewey, or one of the reader's own devising.

Each article is automatically *dated* by its last line.

All of the resources of Science Service, with its staff of scientific writers and correspondents in centers of research throughout the world, are utilized in the editing of this magazine.

How Can Genius Be Discovered?

Psychology

Thomas A. Edison, master inventive genius of his age, is looking for a successor. Forty-nine promising youths, scholastic science leaders of their states, will be nominated by governors and sent to Mr. Edison's laboratory to be subjected to one of the famous Edison questionnaires. A scholarship will be given to the winner.

Six of America's leading psychologists, students of human abilities, have been asked by Science Service to comment on genius and tell how they would pick budding Edisons. Their suggestions, the results of years of study, should aid Mr. Edison and others in locating exceptional individuals and affording them opportunities.

National Search Urged

By Louis M. Terman

Professor of Psychology, Stanford University, and Author of "Genetic Studies of Genius"

The prospect for a nation-wide search for scientific genius grips the imagination. Mr. Edison's provision for this search is one of the most creative, challenging, and daring of all his undertakings.

True, neither science nor common sense has yet solved the riddle of genius, but psychology has made a beginning. There is nothing about genius that is not amenable to scientific investigation. Sometime the budding geniuses in every intellectual and artistic field will be discovered early, tended and looked after as the most prized asset of the nation. Even now the search need not be a blind one. It is possible to identify with considerable certainty the youth who is endowed with scientific talent.

The search should be in charge of a small committee composed of psychologists and physical scientists with a similar cooperating committee in each state. Every high school senior class in the country should be sifted. In this the universal and enthusiastic cooperation of the schools could be expected.

No single technique exists which would be adequate by itself. The principle of progressive sifting should be adopted. First, one or more batteries of intelligence tests should be used. Those rating high in intelligence should be given the David Zyve or a similar test of scientific aptitude. Those surviving this test should be given the E. K. Strong or similar test for measurement of scientific interests. Tests of character and personality traits should follow. Survivors to this point should be rated by competent judges for such traits as industry, persistence in the face of difficulty, unselfishness, cooperativeness, objective-mindedness, and health.

The ratings would be based in part upon observation to supplement the test results. Final selection would be improved by giving some weight to a heredity rating based upon the qualities shown by blood relatives including parents, grandparents, uncles, aunts, and cousins.

The greatest mistake, in short, would be to rely too heavily on a single narrow scope of technique. Finally, the whole bet should not be staked on one horse. If the ten most promising are selected and trained Mr. Edison will have a better chance of finding ultimately the one individual he wants.

Highest Tenth Good Material

By Knight Dunlap

Professor of Psychology, Johns Hopkins University, and Chairman, Division of Psychology and Anthropology, National Research Council

How would I pick a single genius? I wouldn't. To find the most promising group out of a large class of high-school students, I should pick out the quartile of the class making the best school record. As a second elimination contest any good achievement or intelligence test would sort out the highest tenth. But which of these, if any, would prove to be a major contributor to the world's progress no one could predict. Mr. Edison might just as well take the brightest boy in Jersey City or in Lancaster and give him the opportunity of becoming an electrical wizard as to carry the quest through forty-eight states and attempt to pick a potential genius.

Takes Genius to Discover Genius

By Arnold Gesell

Director Psycho-Clinic, Yale University, author of many investigations on child development

Genius comes in many different forms, and there is no general type. Edison has one kind of genius, Einstein another, Kreisler still another. Deliberately to go about finding a successor for any great man it would be necessary to make an inventory of the actual qualities desired and to specify the particular combination in which they are preferred. Genius comes in patterns, not in doses. The qualities would include somewhat general factors like energy, pertinacity, insight, imagination, and the capacity for growth. But they would also include specific habits of work, modes of thought, fields of interest, likes, dislikes, motivations. They would include forms of skill, technical training and knowledge.

An informational questionnaire may measure directly some aspects of intellectual equipment. Only very imperfectly such a questionnaire discloses characteristics which are frequently, but not necessarily associated with certain kinds and degrees of inventiveness.

Science is making definite progress in the measurement of mental ability. Capabilities of the highest order, however, cannot be adequately measured by any known device. They cannot even be justly estimated except by thorough-going and judicious appraisal of numerous factors. The capacity for sustained growth is one of the most important but most difficult to assess.

It almost takes a genius to discover a genius, especially a young one.

Personnel Expert Tells How

By Walter V. Bingham

Director, Personnel Research Federation, and President, Psychological Corporation

There can be no successor to Edison. In his place there will be a whole group of investigators working together. The day has passed when one inventor, no matter how brilliant, can outstrip the organized cooperative efforts of a great research laboratory.

But such laboratories need young men of precisely the type Edison is seeking. When the candidates are brought to Orange in order to select the most promising from the entire country, at least two or three days should be allowed for the examinations. The competition might well make use of some of the well standardized tests of scientific and mathematical ability, mechanical ingenuity, logical memory, and constructive imagination or inventiveness. The battery of tests should include Zyve's tests of scientific aptitude, Thurstone's tests of special thinking, and the Minnesota mechanical ability tests together with such measures of ingenuity as the Carnegie imagination test, Ruger's puzzles, and O'Connor's block assembly. (*Turn to next page*)

Opportunities

Education

While scientifically inclined youths throughout the country make ready to compete for the privilege of training to succeed Thomas A. Edison, a survey indicates that thousands of opportunities await the ambitious and gifted student.

It is estimated that at least 10,000 scholarships are offered annually by American universities and colleges to those taking undergraduate work or about to enter college. Some of these offer full tuition, a few provide living expenses as well and many lend a helping hand to the student's own efforts. Such scholarships allow the student to complete his four years of study leading to a bachelor's degree. A large percentage of them are available for study in the sciences.

When the student has obtained his undergraduate degree and desires to do advanced graduate work in science, some 600 scholarships or fellowships await in science subjects. This is estimated to be the number available in American universities.

To carry training further, to afford opportunity for actual research work under favorable conditions in the laboratories of great teachers and scientists here and abroad, the National Research Council, Washington, administers some 125 research fellowships in medicine, physics, chemistry, biology and allied sciences. Committees of leading scientists choose the fellows on the basis of their training and abilities. Some are given an opportunity to work in agriculture, forestry, and other such branches as well as the more theoretical sciences.

About 80 men and women, among them artists and writers as well as scientists, are given fellowships annually by the John Simon Guggenheim Foundation, New York, to carry on work abroad. The National Research Council and the Guggenheim fellowships are for more mature individuals and possession of a Ph.D. degree or the equivalent is a necessary requisite in most cases. These fellowships are sufficiently generous to allow the holders to pursue their studies without financial worries.

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To carry out Tokyo's plans for rebuilding and city planning since its earthquake, many property owners are being forced to give up one-tenth of their land without compensation, for highway construction purposes.

Careers in Science

Education

Any student considering making science his life work needs advice and information in order that he may apply his peculiar abilities to the best advantage. The National Research Council for the past decade has given special attention to the opportunities which are open to the gifted student. In connection with this work several informative pamphlets have been issued. Among those still available for free distribution in limited number to those seriously interested are: "An Open Letter to College Seniors" by Prof. Carl E. Seashore; "The Gifted Student and Research," by Prof. Carl E. Seashore; "Agriculture Research as a Career," by Dr. E. D. Ball; "The Field for Chemists," by Dr. Wilder D. Bancroft; "Engineering Research as a Career," by Dean A. A. Potter; "Forestry as a Career," by Dean Henry S. Graves; "Geology as a Career," by Prof. James F. Kemp; "Mathematics as a Career," by Prof. C. J. Keyser; "Research in the Medical Sciences," by Prof. Frederick P. Gay; "The Research Career in Public Health," by Dr. David L. Edsall; "Zoological Research as a Career," by Dr. C. E. McClung. Requests should be addressed to the National Research Council, B and 21st Streets, Washington, D. C.

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Search for Genius—*Continued*

Three hours should be set aside for the Thorndike test of abstract intelligence.

Edison's questionnaires, to judge from those which have been published, are not reliable enough. He seems never to have applied to them the rigorous scientific standard of verification which he imposes on his physical and chemical researches. The separate items in the questionnaires need severe pruning and experimental validation. If an information test were to be included in the battery I would use the Inglis vocabulary test as revised by O'Connor. Strong's interest analysis for revealing engineering aptitude would help. The physique of the candidates should also be compared by measuring their endurance and output of energy. Finally their individual rankings in all the separate examinations should be properly weighed and combined in a convenient and statistically sound manner. If there is a mind like Edison's among the candidates this is the surest way to find it.

Search Will Stimulate Young Inventors

By Donald A. Laird

Director, Psychological Laboratory, Colgate University, and Editor of "Industrial Psychology"

Very few men like Edison appear in a century and it will tax the wizard himself to pick a successor. Even though he may not uncover a genius of his peculiar calibre—and I doubt if he will—he is unquestionably doing a great deal through his search to stimulate the interest of a large number of young men in looking toward the future inventive developments of our civilization.

It is to be hoped Edison will impress upon the forty-nine most promising the importance in coming years of directing inventive efforts to man's mental equipment, which his own search shows he realizes is vital to carry on our civilization without a lopsided development. His questionnaire will give an approximate measure of the practical general intelligence of the candidates which is important for inventive genius. But how to measure the emotional drives and real desire for achievement which are also important is still a problem. These non-intelligence factors may be more necessary than mere knowledge and intelligence.

Careers Should Be Followed

By L. J. O'Rourke

Director of Personnel Research, U. S. Civil Service Commission

Mr. Edison's experiment will stimulate general interest in the subject of special aptitudes and individual differences. The 49 different methods adopted by the governors and the District of Columbia commissioners should challenge research students to improve our methods of selecting those with talent.

It would be interesting, though difficult, to follow the contributions to science made by the competitors making high and low scores on the test given by Mr. Edison.

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The magnetic poles are more than 1,000 miles away from the geographic poles.

Billions of Insects to Fight Man's Battles

Entomology

By Frank Thone

Meet *Trichogramma minutum.*

And give the little lady a big hand. For she's a friend of yours, though you may not have known it. She's hardly big enough to see without a magnifying glass, but she packs a knockout wallop for many a one of the insect thugs that are constantly threatening man's property and peace of mind. She's been scrapping 'em on her own for a long time—how long, we shall never know—but at last we have come round to a realization of the help she can give us, and scientists are now busily engaged in providing training quarters for her, and arranging bouts with insect "push-overs," so that she can go out the more effectively after the real "bad eggs" that she has to put down for the long count.

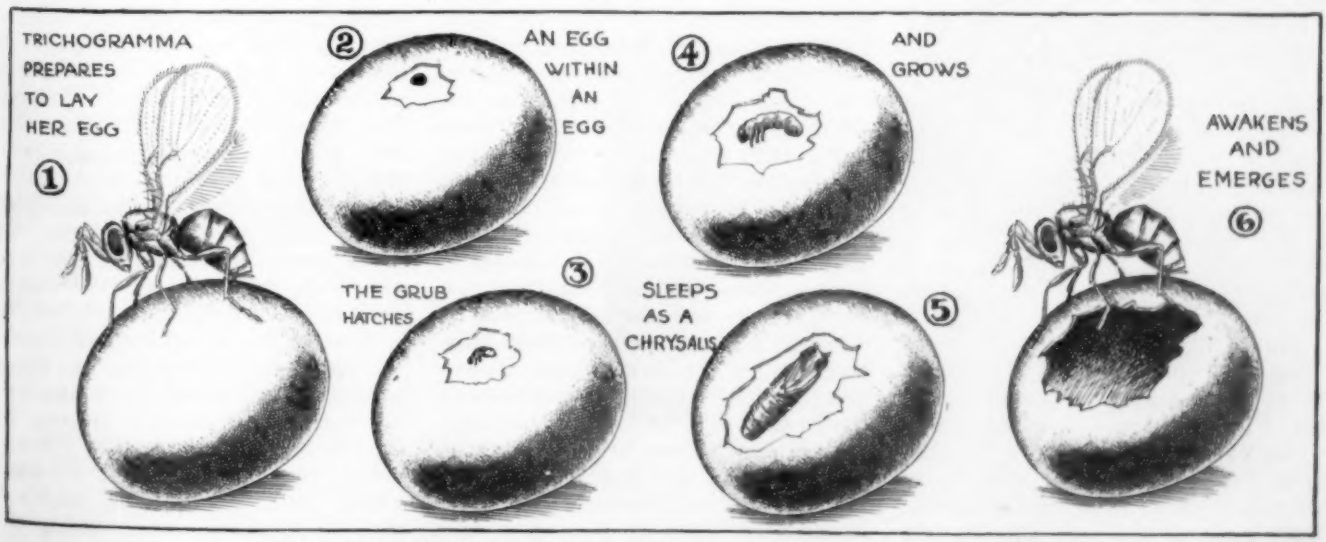
Trichogramma minutum is a lady all right, but she is an insect also, and nothing invidious intended. You'd say she was a rather pretty little lady, if you could see her. But if by any chance you do happen to catch a glimpse of her, you will pass her up as just another undersized gnat. For the ordinary midge or gnat is a pretty big insect alongside of Trichogramma. She's so tiny she can roost on the end of an ordinary sewing needle, like a cat on a fencepost, and not feel particularly crowded for foot-room. On the egg of an ordinary moth, which is about as big as the head of a pin, she walks around comfortably, as a Plymouth Rock hen might walk on Plymouth Rock. This little insect is very fond of

DR. STANLEY E. FLANDERS, field marshal of the Trichogramma armies

taking little walks on the eggs of other and larger insects. She isn't walking just for fun, either. She has eggs of her own to lay, and to her the larger egg represents both nest and a food supply for her young ones when they hatch. She takes a few nervous steps around on the smooth oval surface, selects a suitable spot. Thrust—in goes the sharp, dagger-like ovipositor she carries aft, right through the shell. In a moment the moth egg has company—unwelcome company—within itself. One Trichogramma egg, if the moth or insect was only a little one; more, if the food supply inside will rear a larger family of Trichogramma grubs. The mother insect has been known to deposit as many as seventeen of her eggs inside the egg of a large tiger-moth.

Having deposited her eggs, Trichogramma goes on to the next victim and gives no further thought to the matter. The little grubs that hatch out in a few days, finding a rich food supply right in their mouths the moment they emerge from the shell, feed greedily and grow rapidly. Soon they fold themselves up into pupae, that strange transition form most insects go through, and after a little time emerge as full-grown Trichogrammas. These crawl out through a hole in the egg-shell that has served as their nursery, and are ready to mate and seek new eggs to puncture.

The whole life story of Trichogramma reminds you of that of the hunting wasps, that carry home sting-stunned caterpillars, spiders or other prey, to seal into their clay cells along with their eggs. The resemblance is not superficial, either, for in spite of the vast difference in size between a black wasp and the tiny Trichogramma, they are sisters under their skin. Trichogramma is a member of the wasp family, and her basic instinct, to find rich meat for her offspring (*Turn to next page*)



TRICHOGRAMMA MINUTUM, friend of man—how she grows and works

Billions of Insects—*Continued*

to grow on, simply expresses itself on something she is big enough to tackle.

This business of providing for the future of the race by laying an egg within another egg is by no means uncommon among insects. Many species of minute wasps do it; "egg parasitism" is the learned name the entomologists have given the phenomenon.

But the egg parasitism of Trichogramma is different from that of most of her sister wasplets. These other egg parasites are very choosy as a rule; they will lay their eggs in only one kind of a "host" egg, and hence they are valuable only against one kind of insect pest, or at best against a relatively small group of related insects. But Trichogramma is not fussy. She will lay her eggs in any other eggs she can get at. She will not crawl through a crack to reach the eggs of insects that hide them, nor will she push her way through a silken web such as protects the egg masses of certain other insects. But woe to any kind of insect that lays its eggs unprotected in the open, if this nearly-microscopic wasp happens to be around. She will parasitize any egg into which she can stab that sharp ovipositor of hers. Codling moth, sawfly, European corn borer, sugar cane borer, gipsy moth, brown-tail moth, satin moth, tussock moth, spruce budworm, even the harmless dragonflies—these and a host of others besides are all just so many omelet providers for the insatiable little Trichogramma. Houseflies and mosquitoes are among the comparatively few insects whose eggs she will not touch. Even though one lives by assassinating pests, one must draw the line somewhere.

This universality of appetite is at once the benefit and the bane of Trichogramma, from the human point of view. She will conduct a sweeping campaign against a swarming, multiplying insect pest species in one season, and all but wipe it off the map, but the following year, having herself reduced that particular shelf in the cupboard nearly to Hubbardian bareness, she blithely disregards that pest and turns to the eggs of some other kind of insect. Thus, in one year nine-tenths of the eggs of the cotton caterpillar moth, one of the worst enemies of the cotton crop, were parasitized by Trichogramma in one part of the South, but the following year the shortage of eggs of this species drove the little wasp elsewhere to lay her eggs. Similarly, during one year, Trichogramma killed forty per cent. of the eggs of the European corn borer in Massachusetts. But she did not repeat the performance, so the hopes of the entomologists fell again.

This, then, was the problem that fronted the applied entomologists, those warriors against the chitin-armored hordes that perennially threaten man and all his works. When there were plenty of insect pests, and hence plenty of eggs to be parasitized, there were not enough Trichogramma to take care of all the business. In the years when Trichogramma abounded, there was not always a serious pest situation to handle. How could the matter be brought under human control? How could man guide the processes of nature for his own benefit here, as he has learned to do elsewhere? How arrange things so that billions of moth or sawfly eggs could be met with counter billions of Trichogramma eggs?

When man wants a lot of a thing that grows irregularly and often sparsely in nature, he deliberately cultivates it. He puts out a whole row of apple trees, instead of seeking one chance-planted wild crab bush in the woods. He sows a grain-field, instead of depending on random handsful of grass seed. He coaxes bees to live in hives which he provides (and will subsequently loot) instead of wandering the forest hunting for a bee tree. Why could not some way be devised of hiving these useful little insects also? To this problem entomologists addressed themselves.

There was one precedent, already well established, besides the ancient one of the bees. Ladybird beetles, which are very useful to California citrus fruit growers as devourers of the destructive mealybug pest, have for some time been reared successfully by the agricultural workers of that state. Potatoes are allowed to sprout indoors. Mealybugs are pastured on the sprouts and allowed to increase and multiply. Then ladybird beetles are turned loose to pasture on the mealybugs, and they in their turn increase and multiply. Finally the millions of new ladybirds are gathered up, kept dormant in cold storage until wanted, and then released to clean up the pest-ridden orchards.

There was a young entomologist, named S. E. Flanders, who pondered these things in his heart. He was at the time working for a California walnut growers' association, and the thing that was threatening him with premature gray hair was the common codling moth. The same pest that is responsible for most of our "wormy" apples was playing hob with the highly valuable California walnut crop, and costing the growers endless money and labor in spraying and dusting campaigns. Mr. Flanders knew that Trichogramma parasitizes codling-moth eggs, but here as elsewhere she cannot be depended upon to be present in large enough numbers when the codling moth outbreaks are at their worst. Could not some way be found to produce Trichogramma in quantity, as the ladybird beetles were already being produced? Mr. Flanders thought it worth a try.

So he methodically set about building a Trichogramma nursery. It might well be called a Trichogramma factory, for in the end he developed a method that would produce a million of these insects a day, in a building only 25 by 36 feet in floor size. These can then be distributed to the growers at a very small expense—a package of 100,000 eggs goes by airmail for 35 cents, most of the weight being in the container itself. Released from their mailing-tube prison, the newly-emerged insects wing their way through the walnut groves, seeking codling-moth eggs to conquer.

Mr. Flanders based his mass rearing of Trichogramma on the same principle that had already proved successful in the production of ladybird beetles by the million—the deliberate encouragement of a pest under controlled indoors conditions. He arranged trays of common white corn in racks, spreading out corn by the ton, and then turned one of the worst of granary pests, the grain moth, loose to do her worst. Before long the rearing cages were swarming with moths, anxious to lay their eggs.

Now a grain moth has one reaction at egg-laying time that is almost mechanical. When she comes to a crack she wants to drop an egg into it. Mr. Flanders provided cracks most generously. He let the moths crawl on screen cloth, which is almost all cracks, and, finding that a gentle current (*Turn to next page*)

Billions of Insects—*Continued*

of air would hasten the egg-laying process, provided that, too, by means of an electric fan. So the moths laid their eggs through the screen, and the eggs dropped down into a trough, whence they were gathered up by the laboratory assistants.

Here then was a fine mess of nursing bottles for potential Trichogramma babies. How arrange their nursery to best advantage? Simplicity itself. A piece of stiff paper about 4 by 10 inches, is thinly coated with sticky shellac. Over this the moth eggs are dusted, adhering to the shellac, and giving the general effect of a coarse piece of sandpaper. Approximately 100,000 moth eggs can be stuck to one of these strips. Then the strip is bent around end to end and slipped inside a tin-bottomed cardboard mailing tube, about the size of a common tomato can. This is the maternity ward for the female Trichogramma, the nursery of the babies, and finally the travelling carriage when the new crop of insects journeys to the pest-threatened orchards to do battle with the codling moth.

The cylinders with the egg-laden strips within then are turned upside

A HUNDRED THOUSAND EGGS of Trichogramma are sent across the country by air mail in this container

down on glass shelves, and female Trichogramma, eager to lay their eggs, are liberated inside them. The little insects clamber over the thousands of moth eggs, stabbing and laying, stabbing and laying. Soon every one of the hundred thousand moth eggs harbors its Trichogramma egg.

Then the lids are screwed down on the mailing tubes, and the hecatombs of assassinated moth eggs, loaded with trouble for the orchard pests, are "ready to roll," as they say in the Artillery. If there is a war going on at the moment, they are mailed out to the beleaguered orchardists. In a few days the eggs within the eggs have hatched, the grubs have completed their development, and the adult Trichogramma are ready to go to work in the open. But if all is peaceful along the orchard front, the potential flying armies are put on the reserve list by the simple expedient of piling their containers in a refrigerator. This holds them *in statu quo* until the codling moth is injudicious enough to open hostilities somewhere; then they are brought out into a warmer room and allowed to emerge, armed for battle.

Mr. Flanders has left his walnut growers' laboratory, and this fall will join the staff of the Riverside Laboratories of the University of California. But his work will be carried on by his successors; and he considers his method to be developed now to a point of commercial practicability. For this reason many of his colleagues in the ranks of economic entomology are studying it with concentrated interest. In some other places the use of Trichogramma has been considered (*Turn to next page*)

Crops Must Contain Minerals

Chemistry

If the human race is to continue healthy, the animals on whose meat they feed must be in best condition. And to achieve this, the food they eat must contain the proper supply of minerals and vitamins—a condition to which the farmer must see.

This was the message brought to the American Chemical Society in session at Columbus, Ohio, by C. H. MacDowell, Chicago chemist. Mr. MacDowell told of the farm as a consumer of chemical products.

"The farm is a great bio-chemical factory," said Mr. MacDowell. "The farmer must concern himself with capital, labor, instruments of production and raw materials. The soil is his primary storehouse for raw materials. However, the supplies therein are seldom balanced or complete, and never illimitable. They must be augmented and replenished. Over large areas there are deficiencies of supply not only of the more common food elements such as nitrogen, phosphorus, potassium, calcium and sulphur, but also of the rarer tit-bits such as iodine, magnesium and manganese. The effect of total lack of any one of these latter is often as insidious and far-reaching as a poor supply of the former. If the crops are deficient there may result thinner and weaker livestock and poultry on the farm, milk lacking in vital minerals and vitamins, and so indirectly ill health and deficiency diseases in the city.

"Nor can the native supply of any of these elements in the soil be drawn on indefinitely, without replenishment, if economic stability and financial security are to be maintained on the farm. Inevitably with depletion of plant food supply comes decrease in both quality and quantity of yield. It doesn't rain minerals, and therefore mineral depletion must be counteracted from outside sources.

"Fertilizers undoubtedly comprise by far the largest tonnage of prepared chemicals used on the farm, but they are by no means the only ones. Plant life and animal life are subject to pests and parasites as well as disease and epidemics. These cause untold economic (*Turn to next page*)

Hoover as a Scientist

Metallurgy

Calling attention to the scientific work of President Hoover in the footnotes to his translation of Agricola's classic work on metallurgy, "De Re Metallica," H. M. Elsey, of the Westinghouse Electric Manufacturing Co., expressed the hope that the President may eventually return to this work. He spoke before the meeting of the American Chemical Society.

Agricola's book was published in 1556. It was in 1912, while living in London, that Mr. and Mrs. Hoover collaborated on its translation. The latter was published privately.

"The footnotes are very readable and the longer ones might very well be published unchanged as chapters in a short history of the metals," said Mr. Elsey. "The evidence on a debated point is presented in lengthy quotations from the source books of early science and then the conclusions which may be drawn are given in a most logical manner. Where these conclusions are novel we must needs agree with the careful reasoning of one who approaches his problem as a metallurgist (*Turn to next page*)

Billions of Insects—*Continued*

as of possible value in fighting insect pests. This is notably so in Louisiana, where the planters are even more worried over the wickedness of the cane borer than they are over the tariff. In Illinois the defenders of the corn belt hope to enlist the aid of Trichogramma against their arch-foe, the European corn borer. In New England, whose classic elms are threatened by the gipsy moth, the browntail moth and the tussock moth, this same little ally on wings will probably prove of value if California methods can be worked successfully in the latitude of Boston.

Like many another of our friends in this complex world, Trichogramma was doing her best to help us long before we ever took the trouble to get acquainted with her. She has been on the human list of insect acquaintances only 101 years. It was in 1818 that an English naturalist first observed her, and it was not until a half-century after that, more or less, that entomologists succeeded in finding out some of the details of her life history. A good deal still remains to be learned, in spite of the fact that we are now in position to cooperate with her in her job of destroying the eggs of other insects.

One very curious thing has been learned about her, that is probably of a good deal of help, is her peculiar way of living. Trichogramma is one of those peculiar females who doesn't need a mate in order to produce offspring. She just lays her eggs, and they hatch quite as efficiently as though there had been a paternal ancestor. And in some strains at least, they're all girls. Other females will produce nothing but male offspring; but surely this can't go on indefinitely. Still others have families nearer the ordinary fifty-fifty sex ratio. This is one of the things that entomologists are puzzling over at present, and the solution is not yet in sight.

One German entomologist has reported evolutionary changes in his rearing stocks, of the kind usually called mutations — sudden appearances of individuals quite unlike their parents, whose peculiarities continue to be inherited if the line is kept pure. One such mutation might prove practically valuable. This is a wingless form, which seems to be normal in other respects. If wingless Trichogramma could be got on the large-scale production basis, their use would be made independent of the wind, which, of course, always threatens to carry off the tiny winged insects. They could simply be turned loose on foot, to range over twigs and leaves like doughboys cleaning up a trench system.

But whether this suggestion should prove practicable or not, the practicability of the alliance between man and his tiny ally, Trichogramma, has already been demonstrated, and campaigns against the hordes of six-legged enemies will undoubtedly go on, with the economic entomologist in the role of liasion officer. Not long ago Dr. L. O. Howard, for many years generalissimo of the insect fighters of America, said that "hope could be held out for man in his war with the insects if he could make domestic animals out of these parasitic forms." It seems probable that Mr. Flanders' work will be the first step in making Dr. Howard's dream come true.

Science News-Letter, May 11, 1929

Hoover as Scientist—*Cont'd*

rather than as a historian.

"For example, Mr. Hoover argues that the so-called 'bronze-age' followed rather than preceded the 'iron age' for the reduction of iron from its ores is a very simple process, whereas in making bronze two metals, copper and tin, must be prepared and then melted and cast together to prepare the alloy. Not only is the preparation of iron simpler but it can be carried out in the solid state and the iron worked at a temperature far below the melting point of copper, hence Mr. Hoover concludes that since the simpler and easier process would probably be developed first, the use of iron would precede or at least be developed along with the use of bronze.

"As a closing comment in several of the notes, Mr. Hoover expresses the hope of writing more fully on the subject in question at some time in the future. We all know how fully occupied his time has been since then but we join in wishing that his hopes may be fulfilled, for we are sure that any such papers will be delightful reading to students of science."

Science News-Letter, May 11, 1929

Minerals in Crops—*Continued*

losses to the farmer. They are fought and controlled by chemicals, both inorganic and organic. The mine and smelter, the coke plant and the oil well, furnish their quota in fighting the farmer's foes."

It is getting the proper mineral constituents into the food of cattle that the farmer must take as his responsibility, the speaker stated.

"Agriculture must concern itself most definitely with the proposition of producing crops not only adequate in quantity but so supplied with minerals and vitamins that the animals feeding on them will be in prime physical condition," he declared. "Only in this way can human health be guarded. Food of proper composition is the greatest factor in the continued health of man. Entire civilizations have deteriorated and passed out, largely through diet deficiencies.

"Man is basically dependent on his food supply. The soil is its primal source. If the soil is deficient in nutrients for its benign bacterial inhabitants and for ample plant health and production, the crop suffers. Properly and adequately feed our plant crops to insure their well being, and they will in turn directly and indirectly assure us of our proper food supply.

"Chemical science and chemical products are destined to play an increasingly important and necessary role. Chemicals will continue increasingly to benefit crops, not only as direct plant foods, but by policing the crops from fungus and insect attack affecting quality as well as quantity of product. All for the good of Man."

Science News-Letter, May 11, 1929

A California company is manufacturing paper from grape vine cuttings.

Anemia is a comparatively new and serious disease among pigs, affecting especially those raised in the confined quarters of apartment style hog houses.

Bear-proof garbage cans are an invention used in Sequoia National Park to prevent the nuisance of upset cans in public automobile camp grounds.

Scientific Libraries in Washington

Bibliography

In order to assist members of the American Library Association at their Washington meeting, we have listed below the leading scientific and technical libraries in the District of Columbia. We feel that it will be of interest to all our readers to know of these facilities in the National capital. Libraries of four of the government departments are grouped, for convenience, at the end.

Independent Libraries

American Ethnology Bureau. Smithsonian Inst. 27,141 volumes, 15,937 pamphlets. Librarian: Ella Leary.

American Red Cross. 17th and D Sts., N. W. 3,400 volumes, 2,200 pamphlets. Librarian: Robina Rae.

American University. Nebr. and Mass. Ave., N. W. 50,000 volumes, 15,000 pamphlets. Librarian: Henry G. Statham.

Astrophysical Observatory. Smithsonian Inst. 3,637 volumes, 2,700 pamphlets. Librarian: William L. Corbin.

Bureau of Railway Economics. Transportation Bldg. 125,000 volumes. Librarian: Richard H. Johnson.

Carnegie Institution. 16th and P Sts., N. W. 2,000 volumes. Secretary: W. M. Gilbert.

Catholic University of America. Mich. Ave., N. E., adjoining Soldiers' Home. 50,000 volumes. Librarian: Joseph Schneider.

Congressional Library. 1st and East Capitol Sts. 3,625,000 volumes. Librarian: Herbert Putnam.

George Washington University. 2033 G St., N. W. 57,000 volumes and pamphlets. Librarian: A. F. W. Schmidt.

Geophysical Laboratory, Carnegie Institution. 2801 Upton St., N. W. 3,000 volumes.

Georgetown University, Riggs Memorial Library. 35th and O Sts., N. W. 140,000 volumes. Librarian: P. J. Connican.

Georgetown College Observatory. Georgetown Heights. 2,400 volumes. Director: Rev. Paul A. McNally, S. J.

Georgetown University Medical School. 920 H St., N. W. 4,000 volumes.

Government Printing Office, Superintendent of Documents. North Capitol and H Sts. 396,433 volumes or pamphlets, 31,169 maps, mostly government publications. Librarian: Sarah Ambler.

Langley Aeronautical Library. Smithsonian Inst. 1,600 volumes, 700 pamphlets. Librarian: William L. Corbin.

National Geographic Society. 16th and M Sts., N. W. 10,000 volumes. Librarian: Esther A. Manion.

National Museum. Natural History Bldg. and Arts and Industries Bldg. The Mall at 9th St. 69,300 volumes, 105,700 pamphlets. Librarian: William L. Corbin.

National Zoological Park. Librarian's office at Smithsonian Inst. 1,200 volumes, 300 pamphlets. Librarian: William L. Corbin.

Pan-American Union. 17th and B Sts., N. W. 50,400 volumes and pamphlets. Librarian: Charles E. Babcock.

Public Library of the District of Columbia. N. Y. Ave. and 9th St., N. W. 320,000 volumes. Librarian: George F. Bowerman.

Robert Brookings School of Economics and Government. 1724 Eye St., N. W. 4,000 volumes. Librarian: Caroline Klager.

Science Service. 2101 B St., N. W. 3,500 volumes, 2,000 pamphlets. Librarian: Minna Gill.

Smithsonian Institution. The Mall at 10th St. 700,000 volumes, divided among ten district libraries, located in different parts of Washington. Chief are the Smithsonian deposit at the Library of Congress, which is the Institution's main library, and the library of the National Museum, which is listed separately. See also American Ethnology Bureau, Astrophysical Observatory, Langley Aeronautical Library and National Zoological Park. Librarian: William L. Corbin.

Terrestrial Magnetism Dept., Carnegie Institution. 36th St. and Broad Branch Rd., N. W. 5,000 volumes, 7,000 pamphlets. Librarian: Harry S. Harradon.

Volta Bureau. 35th St. and Volta Place, N. W. 10,000 volumes, 500 pamplets. Librarian: Mrs. Laura Stovel.

Department of Agriculture

Agriculture Department Main Library. 1358 B St., S. W. 200,000 volumes. Librarian: Claribel R. Barnett.

Agricultural Economics Bureau. 1358 B St., S. W. 25,000 volumes, 5,000 pamphlets. Librarian: Mary G. Lacy.

Animal Industry Bureau. 12th and B Sts., S. W. Librarian: Mary F. Thompson.

Chemistry and Soils Bureau. 216 13th St., S. W. 9,700 volumes. Librarian: Minerva G. Beckwith.

Dairying Bureau. 12th and B Sts., S. W. 615 volumes, 4,700 pamphlets. Librarian: Carrie B. Sherfy.

Entomology Bureau. 12th and B Sts., S. W. Librarian: Mabel Colcord.

Experiment Stations Office. 220 14th St., S. W. Librarian: Cora L. Feldkamp.

Fixed Nitrogen Research Laboratory. Nebraska Ave. and Tunlaw Rd., N. W. 2,800 volumes, 1,000 pamphlets. Librarian: Mrs. Mildred S. Sherman.

Forest Service. 930 F St., N. W. 25,535 volumes. Librarian: Helen E. Stockbridge.

Home Economics Bureau. N-O Building, Union Station Plaza, E St., N. W. 2,000 volumes. Librarian: Mrs. M. F. Nystrom.

Plant Industry Bureau. 14th and B Sts., S. W. Librarian: Jessie M. Allen.

Public Roads Bureau. 513 14th St., N. W. 6,000 volumes, 10,000 pamphlets. Librarian: Orrena L. Evans.

Weather Bureau. 24th and M Sts., N. W. 45,000 volumes. Librarian: C. Fitzhugh Talman.

Department of Commerce

Commerce Department (Main Library). 19th St. and Pa. Ave, N. W. 110,000 volumes. Librarian: Anne G. Cross.

Coast and Geodetic Survey. 119 D St., N. E. (Library now moving.) 40,000 volumes, large collection charts and pamphlets. Librarian: Hugh H. Hartley.

Fisheries Bureau. 6th and B Sts., N. W. 41,500 volumes, 1,750 pamphlets. Librarian: Louise Beitzell.

Mines Bureau. 17th and F Sts., N. W. 25,000 volumes. Librarian: Julia H. Clark.

Patent Office (Scientific Library). 9th and F Sts., N. W. 105,000 volumes. Librarian: Miles O. Price.

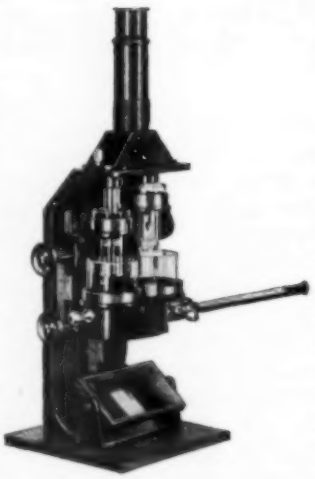
Bureau of Standards. Conn. Ave. and Pierce Mill Rd., N. W. 33,000 volumes. Librarian: A. Fanti.

Department of the Interior

Education *(Turn to next page)*

HYDROGEN ION COLORIMETRY

ALL substances when dissolved in water yield electro-positive ions and electro-negative ions. In any solution, the concentration of the hydrogen ion which is electro-positive, determines the strength of acidity. This value is normally expressed on a logarithmic scale and is designated by the term pH where pH $= \log \frac{1}{(H+)}$ and (H+) is the number of free hydrogen ions.



B. & L. H-ion Colorimeter

Pure water breaks up very slightly according to the equation $(h+)(OH-) = 1 \times 10^{-14}$. Since in this case equal numbers of (H+) and (OH—) ions must exist in the solution, $(H+) = 1 \times 10^{-7}$ and $(OH-) = 1 \times 10^{-7}$. If we regard pure water as neutral, then the condition of neutrality is given by pH = 7. If (H+) increases, the exponent will decrease, and if (H+) decreases, the exponent will increase. In other words, values between pH = 0.0 and pH = 7.0 will be acid, and between pH = 7.0 and pH = 14.0 will be alkaline.

Many organic dyes have the property of changing color, the assumed color being dependent on the pH value of the solution in which they are placed. The pH range of each individual dye is small, but a series can be chosen which will cover the entire pH scale. Thus bromphenol-blue is yellow at pH = 3.1 and blue at pH = 4.7. Between these two values, the color will be a combination of the two colors, the concentration of each component depending upon the exact value of the pH. Similarly thymol-blue is yellow-green at pH — 8.0 and blue at pH = 9.6. The Bausch & Lomb H-ion Colorimeter has been designed to enable the technician to evaluate the color change of the indicator within its own range. It can be used with any indicator desired and thus will cover the entire pH range.

Send for Literature

Bausch & Lomb Optical Company

697 Saint Paul Street

Rochester, N. Y.

Library List—*Continued*

Bureau, 5th and F Sts., N. W. 175,000 volumes. Acting librarian: Martha R. McCabe.

Geological Survey. 18th and F Sts., N. W. 192,000 volumes, 115,000 pamphlets. Librarian: Julia L. V. McCord.

Reclamation Bureau (*Engineering Library*). 18th and F Sts., N. W. 3,200 volumes, 3,800 pamphlets. Engineer in charge: W. I. Swanton.

St. Elizabeth's Hospital. Congress Heights. 10,000 volumes, 4,000 pamphlets. Librarian: Clara Willard.

Department of Labor

Labor Department (*Main Library*). 1912 G St., N. W. 125,000 books and pamphlets. Librarian: Laura A. Thompson.

Department of the Navy

Aeronautics Bureau. Room 2243, Navy Bldg., 18th and B Sts., N. W. 1,000 books and pamphlets. Librarian: (Miss) K. A. Michaelis.

Engineering Bureau. Room 2324, Navy Bldg., 18th and B Sts., N. W. 2,000 volumes.

Hydrographic Office. Navy Bldg., 18th and B Sts., N. W. 4,000 volumes, 2,000 pamphlets. Librarian: Mrs. Nellie H. Crocker.

Naval Observatory. Mass. Ave. and W St., N. W. 31,466 volumes, 6,000 pamphlets. Librarian: (Post vacant).

Naval Medical School. 25th and E Sts., N. W. 22,000 volumes. Librarian: Jean C. Baxter.

Department of the Treasury

Hygienic Laboratory. 25th and E Sts., N. W. 10,530 volumes, 3,000 pamphlets. Librarian: Carrie Myers.

Public Health Service. 25th and E Sts., N. W. 12,703 volumes, 5,400 pamphlets. Librarian: Margaret Doonan.

Department of War

Army Air Service. Munitions Bldg., 19th and B Sts., N. W. 3,300 volumes, 400 pamphlets, large collection of photographs and blueprints. Librarian: Edith Ware.

Army Medical Library. 7th and B Sts., S. W. 281,139 volumes, 390,822 pamphlets. Librarian: Col. Percy M. Ashburn.

Insular Affairs Bureau. Munitions Bldg., 20th and B Sts., N. W. 3,800 volumes. Chief of bureau: Maj. Gen. Frank McIntyre.

Science News-Letter, May 11, 1929

There were 929 women medical students in the United States last year.

CLASSICS OF SCIENCE:

Halley's Comet

Astronomy

The art of calculation of orbits has progressed since Halley's day to such lengths of formulae that it is idle for the amateur astronomer or mathematician to attempt to check up Halley's calculations. Nevertheless, they have been verified by modern astronomers, and 27 returns of the comet identified, from 87 B. C. to 1910 A. D.

THE ELEMENTS OF PHYSICAL AND GEOMETRICAL ASTRONOMY, by David Gregory, M. D. To which is annex'd Dr. Halley's SYNOPSIS OF THE ASTRONOMY OF COMETS. Done into English . . . by Mr. Stone, F. R. S. London, 1726.

Elliptic Orbits of Comets

Hitherto I have considered the Orbits of Comets as exactly parabolic; upon which Supposition it wou'd follow, that Comets, being impell'd towards the Sun by a centripetal Force, would descend as from Spaces infinitely distant; and, by their so falling, acquire such a Velocity, as that they may again fly off into the remotest Parts of the Universe, moving upwards with a perpetual Tendency, so as never to return again to the Sun. But since they appear frequently enough, and since none of them can be found to move with an hyperbolic Motion, or a Motion swifter than what a Comet might acquire by its Gravity to the Sun, 'tis highly probable they rather move in very excentric elliptic Orbits, and make their Returns after long Periods of Time: For so their Number will be determinate, and, perhaps, not so very great. Besides, the Space between the Sun and the Fix'd Stars is so immense, that there is Room enough for a Comet to revolve, tho' the Period of its Revolution be vastly long. Now, the *Latus Rectum* of an Ellipsis is to the *Latus Rectum* of a Parabola, which has the same Distance in its Perihelium; as the Distance in the Aphelium, in the Ellipsis, is to the whole Axis of the Ellipsis. And the Velocities are in a subduplicate Ratio of the same: Wherefore, in very excentric Orbits, the Ratio comes very near to a Ratio of Equality: and the very small Difference which happens, on Account of the greater Velocity in the Parabola, is easily compensated in determining the Situation of the Orbit. The Principal Use therefore of this Table of the Elements of their Motions, and that which indeed induced me to construct it, is, that whenever a new Comet shall appear, we may be able to know, by comparing together the Elements, whether it be any of those which has appear'd before, and consequently to determine its Period, and the Axis of its Orbit, and to foretel its Return. And, indeed, there are many Things which make me believe, that the Comet which *Apian* observ'd in the Year 1531, was the same with that which *Kepler* and *Longomontanus* more accurately describ'd in the Year 1607; and that which I my self have seen return, and observ'd in the Year 1682. All the Elements agree, and nothing seems to contradict this my Opinion, besides the Inequality of the Periodic Revolutions. Which Inequality is not so great neither, as that it may not be owing to physical Causes. For the Motion of Saturn is so disturbed by the rest of the Planets, especially Jupiter, that the Periodic Time of that Planet is uncertain for some whole Days together. How much more therefore will a Comet be subject to such like Errors, which rises almost four Times higher than Saturn, and whose Velocity, tho' encreased but a very little, would be sufficient to change its Orbit, from an Elliptical to a Parabolical one. And I am the more confirmed in my Opinion of its being the same: for, that in the Year 1456, in the Summer-Time, a Comet was seen passing retrograde between the Earth and the Sun, much after the same Manner: Which, tho' nobody made Observations upon it, yet, from its Period, and the Manner of its Transit, I cannot think different from those I have just now mention'd. And since looking over the Histories of Comets, I find, at an equal Interval of Time, a Comet to have been seen about *Easter* in the Year 1305, which is another double Period of 151 Years before the former. Hence, I think, I may venture to foretel, that it will return again in the Year 1758. And, if it should then so return, we shall have no Reason to doubt but the rest may return also: Therefore Astronomers have a large Field wherein to exercise themselves for many Ages, before they will be able to know the Number of these many and great Bodies revolving about the common Center of the Sun, and to reduce their Motions to certain Rules. I thought, indeed, that the Comet, which appear'd in the Year 1532, might be the same with that observ'd by *Hevelius* in the Year 1661. But *Apian's* Observations, which are the only ones we have concerning the first of these Comets, are too rude and inaccurate for any thing of Certainty to be drawn from them, in so nice a Matter. But, as far as Probability from the Equality of Periods, and similar Appearance of Comets, may be urged as an Argument, the late wondrous Comet of 1680/1 seems to have been the same, which was seen in the Time of our King Henry I. *Anno* 1106, which began to appear in the West about the Middle of *February*, and continued for many Days after, with such a Tail as was (*Turn to next page*)

HALLEY'S COMET AS A PORTENT IN 1066, *shown in the Bayeux Tapestry. Modern calculators, using more refined formulae than Halley's, find some of his early dates inexact due to confusion between several comets, and locate one of its appearances in England's fateful year*

Halley's Comet—*Continued*

seen in that of 1680/1. And again, in the Consulate of *Lampadius* and *Orestes*, about the Year of Christ 531, such another Comet appeared in the West, of which *Malela*, perhaps an Eye-Witness, relates that it was . . . *a great and fearful Star;* that it appeared in the West, and emitted upwards from it a long white Beam; and was seen for 20 Days. It were to be wish'd the Historian had told us what Time of the Year it was seen; but, 'tis however plain, that the Interval, between this and that of 1106, is nearly equal to that between 1106 and 1680/1, *viz.* about 575 years. And, if we reckon backward such another Period, we shall come to the 44th Year before *Christ*, in which *Julius Caesar* was murder'd, and in which there appear'd a very remarkable Comet, mentioned by almost all the Historians of those Times, and by *Pliny* in his *Natural History*, *lib.* 11. *c.* 24, who recites the Words of *Augustus Caesar* on this Occasion, which lead us to the very Time of its Appearance, and its Situation in the Heavens. These Words being very much to our Purpose, it may not be amiss to recite them. *In ipsis Ludorum meorum diebus, sydus crinitum per septem dies, in regione Coeli quae sub Septentrionibus, est conspectum. Id oriebatur circa undecimam horam diei, clarumq; & omnibus terris conspicuum fuit.* Now these *Ludi* were dedicated *Veneri genetrici*, (for, from *Venus* the *Caesars* would be thought to be descended, and began with the Birthday of *Augustus*, viz. *Sept.* 23 (as may be collected from a Fragment of an old *Roman* Calendar extant in *Gruter*, pag. 135.) and continued for 7 Days, during which the Comet appeared. Nor are we to suppose that it was seen only those 7 Days, but, possibly, both before and after. Nor, are we to interpret the Words *sub Septentrionibus*, as if the Comet had appeared in the North, but that it was seen under the *Septem triones*, or brighter Stars of *Ursa major*. And as to its Rising, *Hora undecima diei*, it can no ways be understood, unless the word *diei* be left out, as it is by *Suetonius;* for it must have been very far from the Sun, either to rise at five in the Afternoon, or at eleven at Night; in which Cases it must have appear'd for a long Time, and its Tail have been so little Remarkable, that it coul'd by no Means be call'd *clarum & omnibus Terris conspicuum Sydus*. But supposing this Comet to have traced the same Path with that of the Year 1680, the ascending Part of the Orb will exactly represent all that *Augustus* hath said concerning it; and is yet an additional Argument to that drawn from the Equality of the Period. Thus 'tis not improbable, but this Comet may have four Times visited us at Intervals of about 575 Years: Whence the transverse Diameter of its elliptic Orb will be found the cube root of 575 x 575 Times greater than the annual Orb; or 138 Times greater than the mean Distance of the Sun; which Distance, tho' immensely great, bears no Proportion to that of the Fix'd Stars.

I have lately found out a ready Method to compute the Motion of Comets in these elliptic Orbs, of which, perhaps shortly, we may exhibit a Specimen, giving this Comet for an Example. In the mean Time, those that desire to know how to construct Geometrically the Orb of a Comet, by three accurate Observations given, may find it at the End of the third Book of Sir *Isaac Newton's* Principles of Natural Philosophy, entitled, *De Syemate Mundi*, in the Words of its renowned Inventor. Which have since been more fully explained by my very worthy Colleague, Dr. Gregory, in his learned Work of *Astronomia Physica & Geometrica.*

Collision with Earth

One Thing more, perhaps, it may not be improper or unpleasant to advertise the Astronomical Reader; That some of these Comets have their Nodes so very near the annual Orb of the Earth, that if it shall so happen, that the Earth be found in the Parts of her Orb, next the Node of such a Comet, whilst the Comet passes by; as the apparent Motion of the Comet will be incredibly swift, so its Parallax will become very sensible; and the Proportion thereof, to that of the Sun, will be given. Wherefore such Transits of Comets do afford us the very best Means, tho' they seldom happen, to determine the Distance of the Sun and Earth: Which hitherto has only been attempted by Mars, in his Opposition to the Sun; or else Venus in Perigaeo, whose Parallaxes, tho' triple to that of the Sun, are scarce any Ways to be perceived by our Instruments; whence we are still in great Uncertainty in that Affair. This Use of Comets was the ingenious Thought of that excellent Geometrician Mr. *Nicholas Fatio*. Now the Comet of 1472, had a Parallax above twenty Times greater than the Sun's. And if the Comet of 1618, had come down, about the Middle of March, to his descending Node; or if that of 1684, had arrived a little sooner at its ascending Node, they would have been yet much nearer the Earth, and consequently have had more notable Parallaxes. But hitherto none has threatened the Earth with a nearer Appulse, than that of 1680. For by Calculation I find, that Novemb. 11°, 1^h, 6′, *P. M.* that Comet was not above the Semi-diameter of the Sun, to the Northwards of the Way of the Earth. At which Time, had the Earth been there, the Comet would have had a Parallax equal to that of the Moon, as I take it. This is spoken to Astronomers: But what might be the Consequences of so near an Appulse; or of a Contact, or lastly of a Shock of the coelestial Bodies, (which is by no Means impossible to come to pass,) I leave to be discuss'd by the Studious of physical Matters.

Edmund Halley (1656-1742) had shown evidences of unusual ability in mathematics and astronomy even before he entered Oxford at the age of 17. At 20 he went to the island of St. Helena to make observations of the southern stars, for the purpose of more accurate determination of longitude at sea—a vital problem in those days, in which Halley continued his interest throughout life. After devoting two years to the southern stars, he returned, and travelled on the continent. At the age of 24 he studied his first comet, in company with Cassini in Paris. This was the comet of 1680. Another, in 1682, was the one whose elliptical orbit he afterward calculated, as he tells above. Halley was 28 when his studies on the problem of gravitation led him to Cambridge to consult Newton, a journey which resulted in his publishing the "Principia" for his friend. Gravitation, motion of heavenly bodies, longitude calculation, and navigation problems involved also the study of compass variation, and at the age of 42 he obtained his papers as captain of the "Paramour Pink" for an expedition to study that phenomenon. Government, university and Royal Society business occupied the next two decades, then, at the age of 64 he became astronomer-royal. He began a series of observations on the moon which he planned to complete at the age of 82. He did complete it, nearly four years before his death.

Science News-Letter, May 11, 1929

Oil of citronella, popularly associated with mosquitoes, is an important ingredient in soap and perfume industries, its perfume resembling that of the rose.

"Electric Steam" in Vatican Library

Engineering

To preserve priceless manuscripts in the library of the Vatican, an electric steam generator is now being installed. This device emitting steam into the library will keep the ancient books and valuable manuscripts from cracking as a result of the excessively dry air experienced in Rome during the winter months. The steam will enter through a valve operated by a humidistat, thus making the installation completely automatic in operation. To guard against excessive humidity in the summer, seven General Electric air heating units are being used.

The generator was designed by F. B. Hill, electric heating specialist of the General Electric Company, and built by that company.

"The climate of Rome is very changeable," Mr. Hill explained. "In damp weather the atmosphere becomes so humid that the valuable manuscripts in the Vatican collection show a tendency to decay.

"Vatican library authorities solved this problem some time ago by installing electric heating apparatus built by the General Electric Company at the Schenectady plant.

"But this solved only half the problem. Because during the dry season in Rome the air is almost entirely lacking in moisture. Hence the manuscripts become brittle and are in constant danger of cracking and breaking.

"So the Vatican authorities decided that artificially-produced moisture would have to be employed," Hill said.

The moisture-creating device designed by Hill consists of a metal tank which is filled with water, into which a series of electric heating elements have been immersed. These elements are connected to a source of electric power and are operated through humidity gauges and thermostats. This is accomplished by adjusting the apparatus for the desired humidity. When the humidity drops below this point switches are automatically thrown, which connect the supply of electricity to the heating elements. These elements bring the water up to the correct temperature at which it will discharge water vapor into the rooms.

The Vatican possesses the most valuable library of ancient books and manuscripts in the world. There are ponderous tomes printed not so long after Gutenberg invented printing. There are other hand-illuminated books, executed painstakingly by monks who devoted years of loving care to their product. They are devoted quite naturally mainly to ecclesiastical history. There are priceless manuscripts and scrolls. In all there are hundreds of thousands of books and manuscripts in this library, which takes first rank among the world's libraries in its antiquity and in the wealth of historical manuscripts it contains.

There are more than 34,000 ancient manuscripts alone. Included among theme are such priceless items as several of the oldest versions of the Greek New Testament, and the manuscript of Virgil. Probably the most famous manuscript in the entire collection is the Codex Vaticanus, prized by biblical scholars as the most important authority for settling disputes over varying readings of verses of the bible.

The Vatican library also contains more than 400,000 printed books, many of them as priceless as the rarest of the manuscripts. The library was founded in 1447 and has continued uninterruptedly until the present day. The building which now houses the collection was constructed in 1588. Through all of the years, the extraordinarily wet Roman summers and the extraordinarily dry winters have exacted their toll.

Science News-Letter, May 11, 1929

Radio and Magnetic Storm

Radio

Weak radio signals from European stations and stronger signals from nearer ones in America are the forecast of disturbances of the earth's magnetism, or magnetic storms. Stronger signals from distant stations follow such storms. This has been discovered at the Radio Laboratory of the U. S. Bureau of Standards, Miss I. J. Wymore reported to the meeting of the American Geophysical Union.

The researches of which she told were concerned only with the long waves used for high-power transoceanic transmission. Several days before the maximum of the disturbance of magnetism, the signals were weak when received at Washington, but the American stations, those at Tuckerton and New Brunswick, N. J., and Rocky Point, L. I., were decidedly stronger two to four days before.

Science News-Letter, May 11, 1929

Nature Ramblings

By Frank Thone

Natural History

Harebell

There are some flowers that are so little afraid of the cold that they are able to cling close to the edges of retreating continental glaciers, and so establish themselves in a garland all around the northern end of the world. Of such is the lovely blue harebell. It is found clear across North America, clear across Asia, clear across Northern Europe. It is known and loved in all lands where there are people who can appreciate flowers at all. In our own country it does not get very far south, except where mountain heights provide the equivalent of the sub-arctic climate it thrives on.

The harebell is ose of the most celebrated of all flowers that poets have chosen for laudation, for it is the bluebell of Scotland. Oddly enough, however, one of the most loyal of the bards from beyond Tweed, Sir Walter Scott himself, gave it its English name in The Lady of the Lake:

"E'en the slight harebell raised
its head,
Elastic from her airy tread."

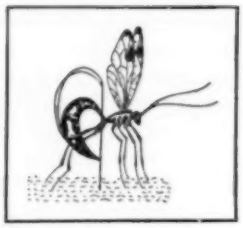
But it may be that Sir Walter was expecting the largest sale for his book in England, and so supplied his readers with a flower they could recognize.

"Slight harebell" is a sure poetic touch, for the thin, strawlike stems of the plant seem scarcely able to support even the little enameled blue bells, fragile and fairy-like though they seem. The harebell is a plant of a double habit, anyway. Its first growth, which persists under the dead leaves and snow through the winter, is a rosette of round leaves laid flat on the ground. In the spring the slender stem shoots rapidly upward to produce the flowers. The leaves that line this stem are narrow and grass-like, so that unless you can find some of the old rosette-leaves you will be puzzled to account for its botanical name of *Campanula rotundifolia.*

Science News-Letter, May 11, 1929

"Go to the ant, thou sluggard, consider her ways and be wise"

OUT of the romantic jungles of the Orient has come this story of insects to fascinate you and give you a new conception of man and his world in



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Instinct and Intelligence is the ripe fruit of those years, a rich story and not a dry pedagogical thesis.

In how far are insects mere machines? Are they capable of thought? Can they solve new and complicated problems? Numberless facts, intensely interesting of themselves, are set forth to show that insects have rudiments of intelligence, reason from cause to effect, adapt means to ends, imitate and learn from experience.

This account of their habits, mentality, and ways of life will hold you like an exotic novel.

Do You Know?

Ants have developed a species of insect cow which they herd and milk and protect in specially constructed barns.

▾ ▾ ▾

Another species of ant does not trust its queens abroad at night. Policemen seize the errant sisters by the neck, hoist them in the air and march them back to the nest.

▾ ▾ ▾

Locusts would flunk any intelligence tests. Ten million times ten million have been observed to plunge into the Euphrates River and drown because instinct made it impossible to change their line of march.

▾ ▾ ▾

Some wasps are the world's most skilled anesthetists and have a knowledge of anatomy which our greatest surgeons would call uncanny. ▾ ▾ ▾

Ants have a well-developed system of slavery. The slaves are kept indoors and made to do the household chores.

▾ ▾ ▾

Through a kind of mistake in instinct, butterflies sometimes have illegitimate love affairs. ▾ ▾ ▾

A kind of wasp penetrates an inch of bark and hard wood with a hair in order to lay her eggs in a grub. (See drawing above.)

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By MAJOR R. W. G. HINGSTON

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FIRST GLANCES AT NEW BOOKS

A PREFACE TO MORALS — Walter Lippmann — *Macmillan* ($2.50). A fearless confronting of the pressing problem of our day, the problem of the moralist in an unbelieving world. Mr. Lippmann finds the ethical and religious world in a state of chaos and sees the present generation slipping away from the control of commandments, customs, creeds and conventions, in short, freed from almost all the sanctions that have in the past regulated human conduct. "It seems to me indisputable that for the modern populace the old rules are becoming progressively unsuitable and the old symbols of hope and fear progressively unreal." He does not presume to set up a substitute system of standards and sanctions, it is too early for that, but he thinks "we can begin to see that the evidence converges upon the theory that what the sages have prophesied as high religion, what psychologists delineate as matured personality, and the disinterestedness which the Great Society requires for its practical fulfillment, are all of a piece, and are the basic elements of a modern morality." Unlike most radical reformers Mr. Lippmann does not ridicule the creeds he discards, but sincerely endeavors to discover what they contained that gave them their usefulness and what of their values may be retained for the future. A conspicuous instance of this, since it deals with a doctrine that nowadays gets kicks on all sides, is his recognition of the permanent value of asceticism as manifest in Buddha, Socrates, the early Christian saints and the Puritans. The eye of the author is equipped with a wide-angle lens; the range of his vision covers the field from Aristotle, Lucretius, Chrysostom and Spinoza to Inge, Fosdick, Whitehead and Ellis.

Philosophy
Science News-Letter, May 11, 1929

EVERYDAY SCIENCE—L. M. Parsons —*Macmillan Co.* (8s 6d). Within this compact book of nearly 700 pages, the whole of science is interestingly presented, not for the reader whose tastes have been developed by modern fiction, but for the serious reader in search of general facts, the busy scientist wishing to refresh his memory on some point of common knowledge, or the British school boy of sixteen for whom the book was primarily written.

General Science
Science News-Letter, May 11, 1929

THE REALIST—Vol. I, No. 1—*Macmillan Co.*, London (2 shillings a copy). This is a new monthly magazine devoted to "Scientific Humanism," which being interpreted in the leading editorial means "If Science is to become articulate (and it can hardly become humane until it does) it must learn to express itself. We stand for making the specialist understood, for introducing the laboratorist, who has lived too long with symbols, to letters, and so giving him that important public which has no time to listen to a man who cannot express himself." The list of contributors include two Huxleys, Julian on "Individuality" and Aldous on "Pascal," Arnold Bennett on "The Progress of the Novel" and Sir Daniel Hall on "Science and the Farmer." Norman Haire explains Steinach's "Rejuvenation" and John Gibson tells why Labour fears Science, and Winifred Holtby discusses the "Psychology of Revivalism," apropos of "the failure of Aimée McPherson" in London. The new journal should find many readers in the United States, although all the editorials are narrowly British in topics, point of view and style of treatment.

General Science
Science News-Letter, May 11, 1929

FOUR FACES OF SIVA—Robert J. Casey—*Bobbs-Merrill* ($5). A journey through Cambodia, one of the truly mysterious places left on earth. The atmosphere of enchantment that hovers over the battered temples and palaces buried in the jungle is well conveyed by the author's colorful and poetic style. But he is as much detective as poet, and so he revels in presenting all the clues he can assemble toward solving the great problems of Cambodia's lost civilization—clues to magnificent rulers and millions of vassals, a great capital city, building enterprises, wars, and then the strange collapse of everything. The finding of a hidden city is one of the high points of interest in the adventure.

Travel
Science News-Letter, May 11, 1929

COMPARATIVE NEUROLOGY — James W. Papez—*Crowell* ($6). This is an introductory textbook on the nervous system and brain in various animals. Form, function and structural interpretation are given, with especial emphasis on the primates. The text is profusely illustrated.

Anatomy—Physiology
Science News-Letter, May 11, 1929

CLINICAL AND EXPERIMENTAL STUDIES IN PERSONALITY — Morton Prince—*Sci-Art* ($5). Students of abnormal psychology will be grateful to Dr. Prince for assembling in convenient form twenty-two of his papers and addresses. Some have appeared in the psychological journals, but others have, as he says, been buried in medical journals not ordinarily accessible to psychologists, and a few have been presented orally but never published. The volume includes papers on the well-known coconscious personality "Sally" and other multiple personality studies, papers on such topics as hypnotism, dream interpretation, experimental study of visions, association neuroses. The selection of material is sufficient to give, in Dr. Prince's opinion, the views that he has "felt justified in advancing as to the interpretations of well-known phenomena, the theories reached regarding various problems of human personality, and the principal data, derived from research, on which they are based."

Psychology
Science News-Letter, May 11, 1929

WHY WE DO IT—Ed Wolff—*Macaulay* ($2.50). Did you ever wonder why we write from left to right, why we send flowers to funerals, why we like the theater? And did you ever struggle to find satisfactory answers in weighty books or try to solve the riddles by your own astute reasoning processes? If so, you will enjoy this collection of human customs, foibles, and anachronisms. The style is breezy, slightly diffuse. The author has sensibly steered clear of controversial discussions by simply giving the explanation that he found to be most widely accepted.

Ethnology
Science News-Letter, May 11, 1929

ANCIENT PAGAN SYMBOLS—Elisabeth Goldsmith—*Putnam* ($3). The author tells us that the ancients "did nothing in a meaningless way and in all their art expressions testified to their profound worship of Life." Such designs as the lotus, the tree of life, sacred birds, the sun, were carved and painted with the thoughtful purpose of symbolizing the life principle. To understand even a little of this symbolism of the ancient world is to find new depths of meaning in all old art and architecture and even in our modern friezes, textile designs, and household decorations.

Ethnology—Art
Science News-Letter, May 11, 1929

The Public Has a Right to Know—

Once the scientist worked in garret or secret den, concealing his discoveries from common men, priests, and kings who did not understand.

But now only the intricacies of science itself stand between the searchers for truth and laymen.

To translate science for the man in the street is the task of Science Service. It is the unique institution established for the purpose of disseminating scientific information to the public. It acts as a liaison agency between scientific circles and the world at large. It interprets original research and reports the meetings of learned societies in a way to enlighten the layman. The specialist is likewise a layman in every science except his own and he, too, needs to have new things explained to him in non-technical language.

Scientific progress is so rapid and revolutionary nowadays that no one can keep up with it from what he learned at school. Science Service endeavors to provide life-continuation courses in all the sciences.

In a democracy like ours it is particularly important that the people as a whole should so far as possible understand the aims and achievements of modern science, not only because of the value of such knowledge to themselves but because research directly or indirectly depends upon popular appreciation of its methods. In fact the success of democratic institutions, as well as the prosperity of the individual, may be said to depend upon the ability of people to distinguish between science and fakes, between the genuine expert and the pretender.

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